

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 660 380 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
03.01.1996 Bulletin 1996/01

(51) Int Cl.⁶: H01L 21/22, H01L 33/00,
H01S 3/19

(43) Date of publication A2:
28.06.1995 Bulletin 1995/26

(21) Application number: 94309534.9

(22) Date of filing: 20.12.1994

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: 23.12.1993 US 172094

(71) Applicant: NATIONAL RESEARCH COUNCIL
CANADA
Ottawa, Ontario K1A 0R6 (CA)

(72) Inventors:

- Charbonneau, Sylvain
Cumberland, Ontario K1Y 1C2 (CA)
- Koteles, Emil S.
Ottawa, Ontario K1Y 0B2 (CA)

(74) Representative: Skone James, Robert Edmund
London EC2M 7LH (GB)

(54) Bandgap tuning of semiconductor quantum well structures

(57) A method of selectively tuning the bandedge of a semiconductor heterostructure includes repeatedly forming a disordered region that is spatially separated from a quantum well active region and subsequently annealing the heterostructure each time after the disordered region is formed, so that vacancies/defects in the disordered region diffuse into the quantum well region and enhance interdiffusion at the well-barrier heterojunctions. Repeating, the disordering followed by annealing allows for a greater range in bandgap tuning. The heterostructures of interest are III-V material systems, such as AlGaAs/GaAs, where the active region includes structures such as a single quantum well, a multiple quantum well, or a superlattice.

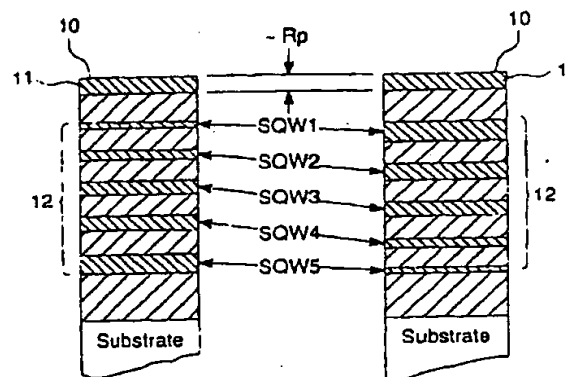


Fig. 1a

Fig. 1b

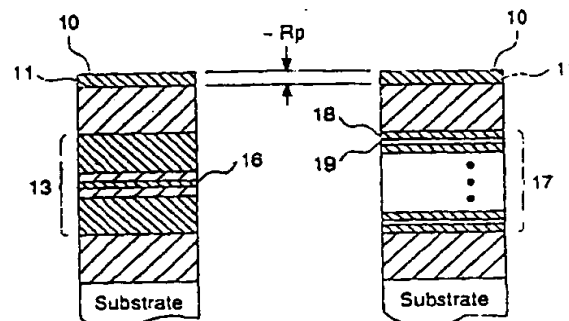


Fig. 1c

Fig. 1d

CORRIGENDUM issued on 14.02.96

EP 0 660 380 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 9534

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	EP-A-0 429 979 (GTE LABORATORIES INC) 5 June 1991 * the whole document *	1-9	H01L21/22 H01L33/00 H01S3/19
A	JOURNAL OF APPLIED PHYSICS, vol. 66, no. 5, pages 2104-2107, XP 000261005 ELMAN B ET AL 'GAAS/ALGAAS QUANTUM-WELL INTERMIXING USING SHALLOW ION IMPLANTATION AND RAPID THERMAL ANNEALING' * the whole document *	1-9	
A	JOURNAL OF APPLIED PHYSICS, vol. 73, no. 4, 15 March 1993 NEW YORK US, pages 1686-1692, I.V. BRADLEY ET AL 'The effects of ion implantation on the interdiffusion coefficients in InGaAs/GaAs quantum well structures' * the whole document *	1,3	
P,X	APPLIED PHYSICS LETTERS, vol. 65, no. 5, 1 August 1994 NEW YORK US, pages 621-623, P.G. PIVA ET AL 'Enhanced compositional disordering of quantum wells in GaAs/AlGaAs and InGaAs/GaAs using focussed Ga ⁺ ion beams' * the whole document *	1-9	
<div style="text-align: right;">TECHNICAL FIELDS SEARCHED (Int.Cl.6)</div> <div>H01S H01L</div>			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 November 1995	Examiner Claessen, L
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1501 (11/94) (PNCB)